Aero-Acoustic-Structural Optimization Analysis and Testing, Phase I

Completed Technology Project (2007 - 2008)

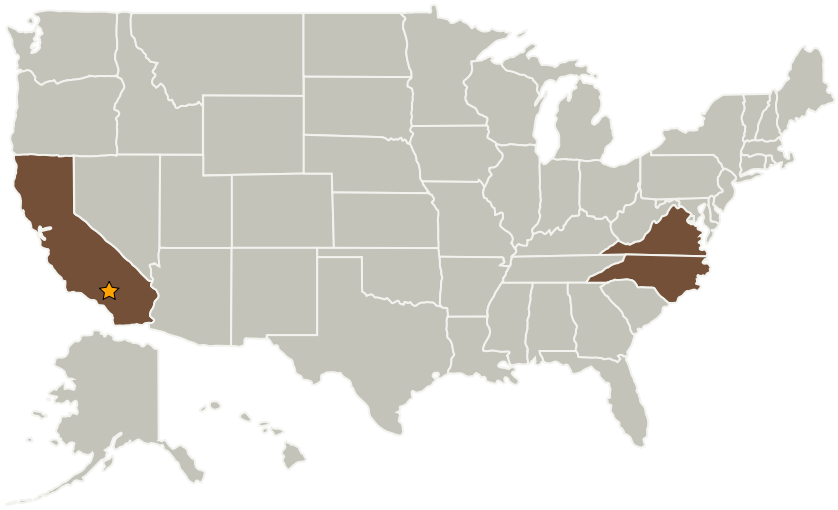
Project Introduction

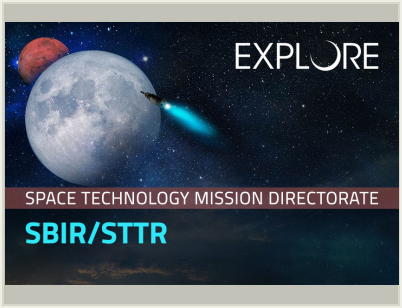
This proposal effort is concerned with the development of a novel multidisciplinary optimization scheme and computer software for the effective design of advanced aerospace vehicles. Such vehicles are characterized by unprecedented levels of aero-structural-controls-propulsion interactions, a multidisciplinary simulation is essential for their effective design, vehicle can be accomplished by employing the common finite element method for the structures and also FE/FV fluids and propulsion simulations. A typical multidisciplinary optimization scheme will involve structural design for minimum weight with aerodynamic data such as drag and wing platform as design variable, subject to constraints like flutter and structural strength. Much emphasis is placed on the choice and calculation of suitable gradient of objective function as well as the contraints to guarantee global optimal solution. A number of novel numerical scheme will also be developed for efficient, cost effective solution of large complex 3-D practical problems such as current and future flight vehicles. In Phase I, the basic numerical schemes for the optimum design will be established along with a pilot code to verify these techniques. Based on our finding in Phase I, a complete software will be developed and checked out for the simulation of complex practical problems in Phase II.

Anticipated Benefits

Much application of this product is expected in the economical design of aerospace vehicles, machineries, buildings, boats and turbines.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
2020 Company, LLC	Supporting Organization	Industry	Falls Church, Virginia
North Carolina A & T State University	Supporting Organization	Academia	Greensboro, North Carolina

Primary U.S. Work Locations	
California	North Carolina
Virginia	

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Project Manager:
Kajal K Gupta

Principal Investigator:
C. Lawson

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.3 Aeroelasticity